

A new pseudoscorpion species of the genus *Geogarypus* (Arachnida: Pseudoscorpiones) from Iran

Mahrad Nassirkhani

Entomology Department, Faculty of Agriculture and Natural Resources, Islamic Azad University,
Arak branch, Arak, Iran
E-mail address: greenartificialturfgrass@gmail.com

Abstract — A new species, *Geogarypus harveyi*, which was collected from leaf litter habitats in the Khabr National Park is reported and described from Iran.

Key words — Arachnida, Pseudoscorpions, Geogarypidae, Iran

Introduction

The pseudoscorpion fauna of Iran is currently represented by 42 species in 23 genera and nine families (Harvey 2013; Christophoryvová et al. 2013; Nassirkhani and Takkaloouzade 2013a, 2013b). The first pseudoscorpion to be reported from Iran was *Chelifer spinipalpis* Redikorzev 1918, now is placed in the genus *Strobilochelifer* (family Cheliferidae) which was described from Bazman, in south-eastern Iran (Redikorzev 1918). Recent collecting in Iran has revealed some species not previously recorded from the country: *Gobichelifer chelanops* (Redikorzev 1922) (Nassirkhani & Takkaloouzade 2013a), *Dactylochelifer spasskyi* Rredikorzev 1949 (Nassirkhani & Takkaloouzade 2013b) and *Megachernes pavlovskyi* Redikorzev 1949 (Mirmoayedi, Sharifi & Hemmati 2000; Christophoryová et al. 2013).

I have collected pseudoscorpion specimens from six protected areas and one national park in Iran during spring and summer in 2013. Amongst these collections, I found an undescribed species of *Geogarypus*, which will be described here as new.

Material and methods

The specimens used in this study were collected from leaf litter in the Khabr National Park, south-eastern Iran. The specimens were collected directly by sieving leaf litter and extracted by using a thin needle from a hypodermic syringe.

All specimens were preserved in 70% ethanol and were prepared for study as follows. The pedipalps, chelicera, first and fourth legs were removed from the body, cleared with 60% lactic acid, and mounted on dished glass microscope slides in Hoyer's medium (a mixture of distilled water, chloral hydrate, Arabic gum and glycerin). The duration of the clearing phase was dependent on the degree of sclerotization

of the body. The specimens were examined and illustrated with an Olympus BH-2 compound microscope and drawing tube attachment. The specimens are lodged in Collection of the Acarology Laboratory, Islamic Azad University of Arak (IAUA), Iran.

Morphological terminology follows Chamberlin (1931), Harvey (1992), Judson (2007) and Harvey et al. (2012). The following trichobothrial abbreviations were employed: *eb*=external basal; *esb*=external sub-basal; *ib*=internal basal; *isb*=internal sub-basal; *ist*=internal sub-terminal; *est*=external sub-terminal; *it*=internal terminal; *et*=external terminal; *t*=terminal; *sb*=sub-basal; *st*=sub-terminal. In addition, the following abbreviations are used: mm=millimeter; L=length; W=width; H=height.

Family Geogarypidae Chamberlin 1930

Genus *Geogarypus* Chamberlin 1930

Geogarypus harveyi sp. nov.

(Figs. 1–2)

Material examined. IRAN: Kerman Province: holotype male, allotype female, Baft, Khabr National Park, leaf litter, beside pond [28°52'45"N, 56°23'56"E], July 2013, M. Nassirkhani (IAUA); Paratypes: 5 males, 3 females, collected with the holotype (IAUA).

Diagnosis. *Geogarypus harveyi* differs from the other species of the genus by the following combination of characters: unicolored carapace; simple setae with different sizes on the anterior margin of carapace; size of pedipalp (e.g. chela of males 0.95–1.02 mm in length and 0.22–0.24 mm in width).

Description. Adults (Figs. 1–2). Body length: 1.66–1.78 mm for males and 1.60–1.87 mm for females.

Carapace: uniformly dark brown, lateral margins darker; hardly sclerotized; heavily granulate; distinctly wider than long, L/W 0.74–0.90 for both sexes; front margin elongated

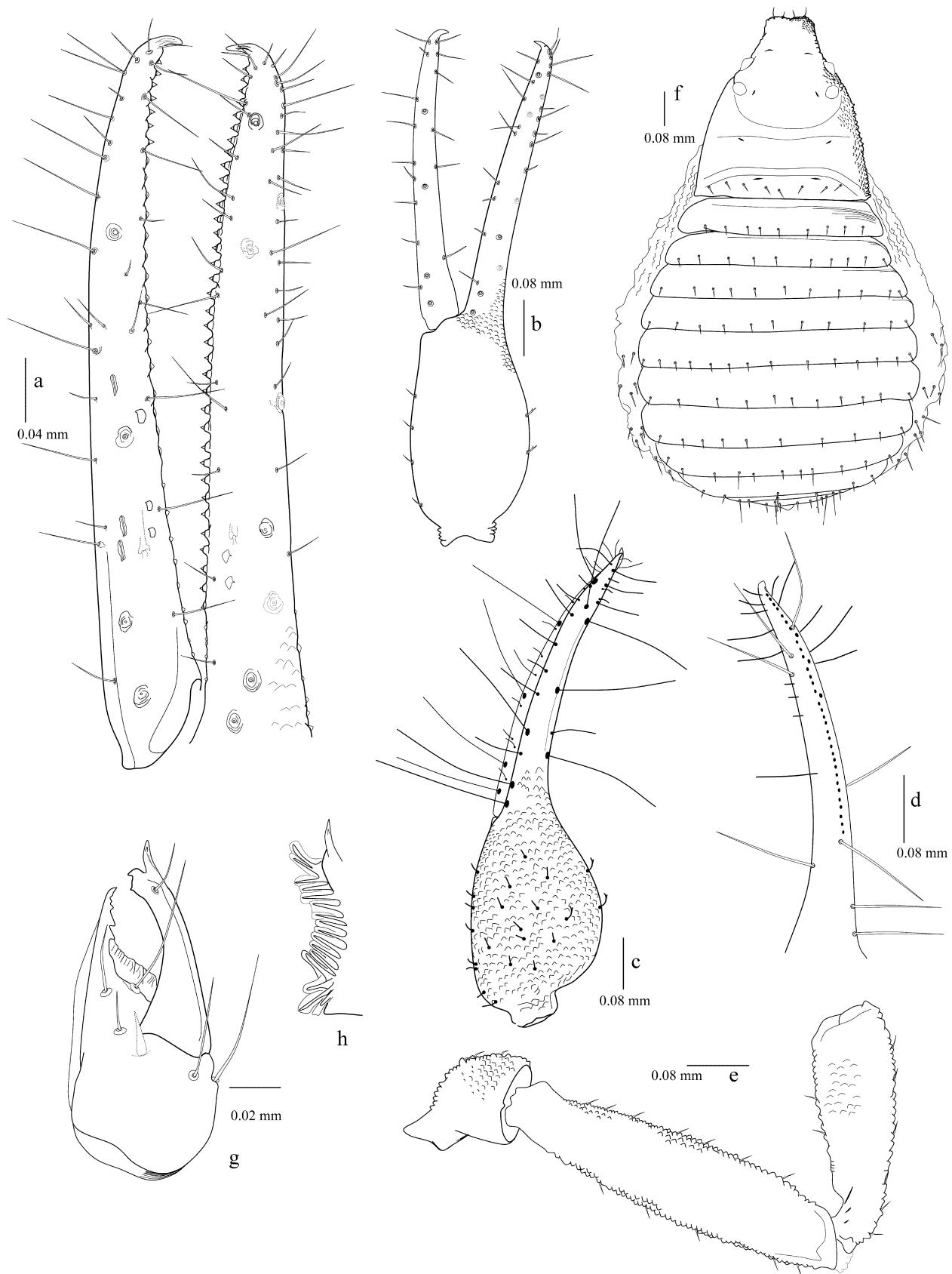


Fig. 1. *Geogarypus harveyi* sp. nov., male holotype (except, d: one of male paratypes). a, chelal fingers, lateral; b, left chela, lateral; c, dorsal aspect of right chela; d, fixed finger showing teeth arrangement, dorsal; e, right pedipalp, except chela; f, dorsal side of body; g, right chelicera; h, serrula exterior.

distally, snout-like (Fig. 1f), with 10–12 setae; anterior margin with 4 setae, 2 short setae situated medially and 2 long setae situated sub-medially (Fig. 1f); posterior margin extended laterally, with 8–10 setae; with 2 pairs of well-developed corneate eyes situated away from anterior margin on small protruding mound, anterior eyes slightly larger than posterior eyes, one short seta situated between eyes; anterior furrow present and curved posteriorly; posterior furrow present but indistinct, curved anteriorly; setae simple, narrow and acute; with 8 distinct lyrifissures, first pair situated distal to anterior eyes, second pair slightly posterior to eyes, third pair situated closer to anterior furrow than posterior margin and fourth pair situated near posterior margin.

Tergites: dark brown, slightly lighter in color than carapace; less sclerotized and granulated than carapace; without median suture line; tergal setae situated regularly in single row; tergite X with 2 pseudo-tactile setae situated laterally; tergite XI with 2 long tactile setae situated sub-laterally; anal plates (tergites XI and sternites XII) situated between tergite XI and sternite XI, with one circum-anal seta; most tergal setae simple, acute and narrow; tergites with setae arranged: 8–10: 9–10: 9–10: 10–12: 10–14: 10–14: 10–13: 10–13: 7–9: 6–8: 8+1: 2 for males and 8–9: 9–10: 9–11: 11–13: 10–12: 10–11: 12–13: 9–12: 10: 7: 8+1: 2 for females.

Sternites: brown, lighter in color than tergites; sclerotized; not granulate; sternites III–VII with median suture line; sternite XIII–X without median suture line; sternites IV–X with regular setae in one row; sternites IX and X with 2 long tactile setae situated medially; anterior trachea larger than posterior trachea; lateral genital sacs very long with huge terminal (Fig. 3e) and two pairs of glandular setae; females with 2 elongate cribiform plates situated sparsely (Fig. 3d); anus without circum-anal setae; sternites with setae arranged: 9–11: (0)4–8(0): (1)4–6(1): 8–10: 9–12: 10–11: 10–11: 9–11: 6–8: 6–8: 0 for males and 6–7: (0)2–4(0): (1)2(1): 8: 10–11: 10–11: 10–11: 9–10: 6–7: 4–6: 0.

Pleural membrane: roughly striate; with 11–12 simple setae on each side.

Chelicera: light brown; galeal seta present and situated sub-distally; galea simple, short and stout with one terminal and one sub-terminal rami; hand with 5 simple setae (Fig. 1g); rillum with one simple blade (Fig. 1g); serrula exterior with 12–14 blades (Fig. 1h); palm of hand with 5 lyrifissures; fixed finger with 5 teeth, two terminal teeth smallest; movable finger with one curved and acute terminal lobe and two small teeth.

Pedipalps: dark brown, chela darker in color than femur and patella, chelal fingers brown; heavily granulate, chelal granulation slightly extended to basal margin of fixed finger (Fig. 1a); most setae simple and short; trochanter L/W 1.66–1.78 for males and 1.80–1.87 for females; femur without obvious pedicel, retrolateral margin straight and prolateral margin slightly curved distally (Fig. 1e), L/W 4.33–4.64 for

males and 4.17–4.37 for females; patella with curved and short pedicel, prolateral margin slightly curved distally, with 3 lyrifissures, third lyrifissure longest (Fig. 1e), L/W 3.00–3.21 for both sexes; chela with short pedicel and distinctly dorsal projection (Figs. 1b, 1c); chela (with pedicel) L/W 4.32–4.54 for males and 4.07–4.28 for females; chela (without pedicel) L/W 4.18–4.36 for males and 3.89–4.08 for females; hand (with pedicel) L/W 1.79–1.95 for both sexes; movable finger distinctly longer than hand with pedicel; movable finger 1.34–1.45 longer than hand with pedicel for both sexes; fixed finger with 8 and movable finger with 4 trichobothria (Fig. 1a); fixed finger with trichobothrium *it* closer to *est* than *et*, *ist* situated medially, *est* slightly closer to *ib* than *isb*, *ib* situated in basal third of finger, *isb* situated distinctly anterior to *ib*, *esb* and *eb* situated distinctly posterior to *ib*; movable finger with trichobothrium *st* situated medially in equal distance to *t* and *sb*; most teeth of chelal fingers acute and prominent; fixed finger with 35–38 triangular-shaped teeth (3 teeth situated outside of row (Fig. 1d)), 4–5 small teeth situated basally and 4 accessory teeth present; movable finger with 7–10 triangular-shaped, 13–15 blunt and 3–4 semi-circle weakly sparse teeth, 3–4 small teeth situated basally and 3 accessory teeth present; nodus ramosus present in both finger, situated slightly posterior to *ib* in fixed finger and basal third of movable finger; venom duct elongate in both finger.

Legs: light brown; lighter in color than abdomen; granulate; all setae simple and acute; claws symmetrical, stout and short; arolium simple and slightly longer than claws (Figs. 2b, 2c); **leg I:** each coxa with 4–5 simple and acute setae; tibia L/W 3.66–3.83 for males and 3.28–3.57 for females; metatarsus L/W 3.00–3.20 for males and 3.40 for females; tarsus L/W 3.75–5.00 for males and 4.25 for females; **leg IV:** each coxa of leg IV with 16–18 setae for males and 32–24 setae for females; femur joined widely, femur+patella L/W 3.53–3.70 for males and 3.60–4.07 for females; tibia L/W 4.50–5.28 for both sexes; metatarsus L/W 3.40–3.80 for males and 3.66–3.80 for females; tarsus L/W 4.50–4.75 for males and 4.66–5.00 for females.

Dimensions (L/W, in mm). Males: **Carapace:** 0.55–0.60/0.60–0.75. **Pedipalp:** trochanter 0.25–0.26/0.14–0.15; femur 0.62–0.68/0.14–0.16; patella 0.42–0.47/0.14–0.15; chela (with pedicel) 0.95–1.02/0.22–0.24; chela (without pedicel) L. 0.92–0.98; hand L. 0.41–0.43; movable finger L. 0.55–0.61. **Leg I:** tibia 0.22–0.23/0.06–0.07; metatarsus 0.15–0.16/0.05; tarsus 0.15–0.16/0.03–0.04. **Leg IV:** femur+patella 0.48–0.53/0.13–0.15; tibia 0.35–0.37/0.07–0.08; metatarsus 0.18–0.19/0.04–0.05; tarsus 0.18–0.19/0.04. Females: **Carapace:** 0.63–0.66/0.62–0.79. **Pedipalp:** trochanter 0.27–0.30/0.16–0.17; femur 0.69–0.71/0.16–0.17; patella 0.50–0.51/0.16–0.17; chela (with pedicel) 1.07–1.10/0.25–0.27; chela (without pedicel) L. 1.02–1.05; hand L. 0.43–0.47; movable finger L. 0.63–0.64. **Leg I:** tibia 0.23–0.25/0.07; metatarsus 0.17/0.05; tarsus 0.17/0.04. **Leg IV:** femur+patella 0.54–0.57/0.14–0.15; tibia 0.38–0.41/0.08–0.09; metatarsus 0.19–0.22/0.05–0.06; tarsus

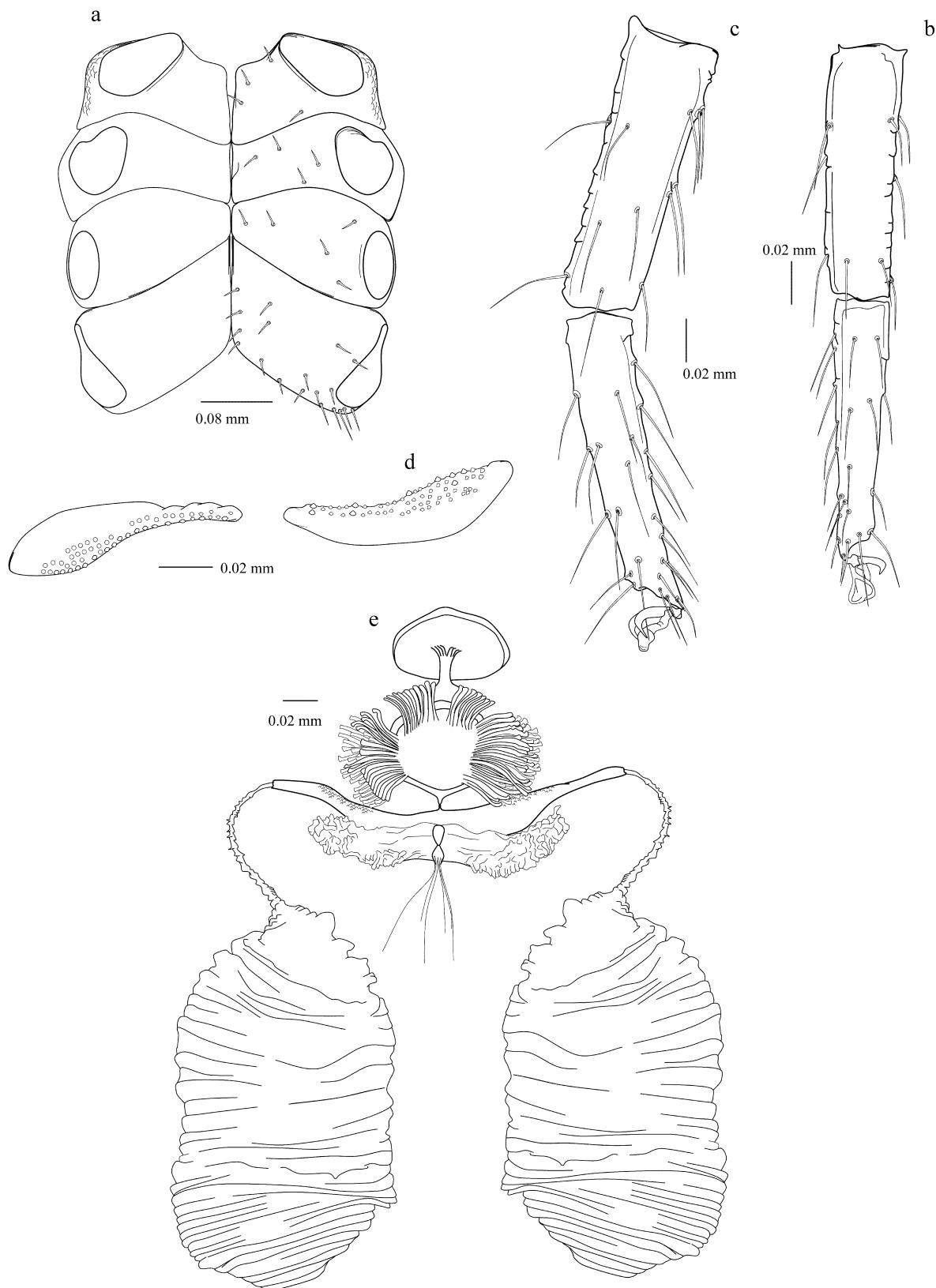


Fig. 2. *Geogarypus harveyi* sp. nov. (a–c, e: male holotype; d: female allotype). a, coxae, ventral; b, metatarsus and tarsus I; c, metatarsus and tarsus IV; d–e, genitalia.

0.20–0.21/0.04–0.05.

Remarks. Only a few species of *Geogarypus* have been recorded from the Middle East and adjacent regions such as Central Asia, North Africa and Europe: *G. azerbaidzhanicus* Dashdamirov, *G. continentalis* (Redikorzev), *G. hungaricus* (Tömösváry), *G. minor* (L. Koch), *G. nigrimanus* (Simon), *G. pulcher* Beier, *G. mirei* Heurtault and *G. shulovi* Beier. The original and only description of *G. hungaricus* is insufficient to recognize it (Tömösváry 1882). *Geogarypus harveyi* is compared to the other species as follows.

Geogarypus shulovi was originally described from Israel (Beier 1963a) and later recorded from under stones in Maku, Iran (Beier 1971). The chela (without pedicel) of *G. shulovi* is distinctly stouter and shorter than that of *G. harveyi* (Beier 1963a): $4.7 \times (1.50/0.32$ mm for males) in *G. shulovi* and $4.18\text{--}4.36 \times (0.92\text{--}0.98/0.22\text{--}0.24$ mm) for males and $3.89\text{--}4.08 \times (1.02\text{--}1.05/0.25\text{--}0.27$ mm) for females in *G. harveyi*. In addition, the pedipalpal femur is clearly longer in *G. shulovi* ($0.91/0.19$ mm for males and $1.00/0.21$ mm for females) than in *G. harveyi* ($0.62\text{--}0.68/0.14\text{--}0.16$ mm for males and $0.69\text{--}0.71/0.16\text{--}0.17$ mm for females).

Geogarypus pulcher from Israel (Beier 1963a) is easily distinguished from *G. harveyi* by the stouter pedipalps, for example the femur L/W of *G. pulcher* is $0.78\text{--}0.85/0.20\text{--}0.22$ mm and the chela (without pedicel) L/W $1.29/0.36$ mm for females. In addition, the carapace of *G. pulcher* has pale patches, whereas that of *G. harveyi* is uniformly dark brown.

Geogarypus continentalis from Kazakhstan, Kirghizia and Pakistan (Dashdamirov & Schawaller 1993a, b, Dashdamirov 2004) is easily separated from *G. harveyi* by the presence of denticuloclavate setae on the anterior margin of the carapace (Dashdamirov 2004). All setae on the anterior margin of the carapace are simple in *G. harveyi* which resembles that of *G. azerbaidzhanicus*. In *G. azerbaidzhanicus*, all four setae are simple but equal in length while the two median setae on anterior margin of *G. harveyi* are shorter than the two sub-medial setae.

Geogarypus mirei was described from Chad (Heurtault 1970) and resembles *G. harveyi* in the unicolored carapace. It differs, however in pedipalpal size; for example the femur of *G. mirei* is distinctly longer and slightly stouter ($0.75\text{--}0.82/0.16\text{--}0.17$ mm for females) than that of *G. harveyi*. Also, the pedipalpal chela (without pedicel) of *G. mirei* is distinctly longer and stouter ($1.22\text{--}1.27/0.33\text{--}0.35$ mm for females) than that of *G. harveyi* ($1.02\text{--}1.05/0.25\text{--}0.27$ mm for females).

Geogarypus minor and *G. nigrimanus* can be separated from the new species by the position of trichobothrium est which is located much closer to *ib* than *isb* and the chelal ratio which is less than $4.00 \times$ (Beier 1963b).

Etymology. This species is named in honor of Mark S. Harvey for his contributions to the study of pseudoscorpions.

Acknowledgements

I wish to thank the Vice Chancellor of Research and the Faculty of Agriculture at Islamic Azad University of Arak, Iran for their support. I am also extremely grateful to Dr. Mark S. Harvey for his support, Dr. Christoph Hörweg who provided some literatures and Mr. Mahmoud Nassirkhani for his assistance.

References

- Beier, M. 1963a. Die Pseudoscorpioniden-fauna Israels und einger angrenzender gebiete. Israel J. Zool., 12, 183–212.
- Beier, M. 1963b. Ordnung Pseudoscorpionida (Afterskorpione) (pp. vi, 313 pp.). In: Bestimmungsbücher zur Bodenfauna Europas, vol. 1. Akademie-Verlag: Berlin.
- Beier, M. 1971. Pseudoscorpione aus dem Iran. Ann. Naturhistor. Mus. Wien, 75: 357–366.
- Chamberlin, J. C. 1930. A synoptic classification of the false scorpions or chelaspiders, with a report on cosmopolitan collection of the same—Part II. Stanford Univ. Publ., Ann. Magaz. Nat. Hist., 10(5), 385–404.
- Chamberlin, J. C. 1931. The arachnid order Chelonethida. Stanford Univ. Publ., Biol. Sci., 7(1), 1–284.
- Christophoryová, J., Dashdamirov, S., Malek Hosseini, M. J. & Sadeghi, S. 2013. First record of the genus *Megachernes* (Pseudoscorpiones: Chernetidae) from an Iranian cave. Arachnol. Mitteil., 46, 9–16.
- Dashdamirov, S. 2004. Pseudoscorpions from the mountains of northern Pakistan (Arachnida: Pseudoscorpiones). Arthropoda Selecta, 13, 225–261.
- Dashdamirov, S. & Schawaller, W. 1993a. Pseudoscorpions from Middle Asia, Part 2 (Arachnida: Pseudoscorpiones). Stuttgarter Beitr. Naturk., A 496, 14 pp.
- Dashdamirov, S. & Schawaller, W. 1993b. Pseudoscorpions from Middle Asia, Part 3 (Arachnida: Pseudoscorpiones). Stuttgarter Beitr. Naturk., A 497, 16 pp.
- Harvey, M. S. 1992. The phylogeny and classification of the Pseudoscorpionida (Chelicera: Arachnida). Inverteb. Taxon., 6, 1373–1435.
- Harvey, M. S. 2013. Pseudoscorpions of the World, version 3.00 Western Australian Museum. Available from: <http://museum.wa.gov.au/catalogues-beta/pseudoscorpions> [accessed 15 December 2013].
- Harvey, M. S., Ratnaweera, P. B., Randeniya, P. V. & Wijesinghe, M. R. 2012. A new species of the pseudoscorpion genus *Megachernes* (Pseudoscorpiones: Chernetidae) associated with a threatened Sri Lankan rainforest rodent, with a review of host associations of *Megachernes*. J. Nat. Hist., 46, 2519–2535.
- Heurtault, J. 1970. Pseudoscorpions du Tibesti (Tchad) II. — Garypidae. Bull. Mus. Nation. Hist. Nat., Ser. 2, 41(6): 1361–1366.
- Judson, M. L. I. 2007. A new and endangered species of the pseudoscorpion genus *Lagynochthonius* from a cave in Vietnam, with notes on chelal morphology and the composition of the Tyrannochthoniini (Arachnida, Chelonethi, Chthoniidae). Zootaxa, 1627, 1–56.
- Koch, L. 1873. Uebersichtliche Darstellung der Europäischen Chernetiden (Pseudoscorpione). Bauer und Raspe, Nürnberg, 68 pp.
- Mirmoayedi, A., Sharifi, M. & Hemmati, Z. 2000. *Megachernes pavlovsky* (Redikozhev 1949) [sic] species of pseudoscorpion, first record from Iran. Ninth Iranian Biology Conference, 15–17 August 2000, University of Tehran, p. 108.
- Nassirkhani, M. & Takkalloo zade, H. M. 2013a. The first record of *Gobichelifer chelanops* (Pseudoscorpiones: Cheliferidae) from Iran. Acta Arachnol., 62: 13–18.
- Nassirkhani, M. & Takkalloo zade, H. M. 2013b. The first report of *Dactylochelifer spasskyi* Redikorzev (Pseudoscorpiones: Cheliferidae) from Iran. Iranian J. Entomol. Res., 18 [In press].
- Simon, E. 1879. Arachnides de France, d'Espagne et d'Algérie. Bull. Soc. Zool. France, 4: 251–263.
- Tömösváry, O. 1882. A Magyar fauna álskorpiói. Magyar Tudományos Akadémia Matematikai és Természettudományi Közlemények, 18: 135–256.

Received May 2, 2014 / Accepted August 19, 2014